Livestock Mortality
Burial Techniques

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Livestock

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INTRODUCTION

All livestock or poultry farms have dead animals (mortalities) resulting from disease, accidents and competition. Under Alberta's *Destruction and Disposal of Dead Animals Regulation*, farmers with any type of domestic animal (including poultry) are required to dispose of mortalities within 48 hours after knowledge of their death. Disposal of any animal suspected or known to have died of a reportable disease must be done according to the *Health of Animals Act* (Canada). The options for disposal under Alberta's Regulation are:

- Burial
- Incineration
- Composting
- Rendering
- Natural Disposal (except for animals euthanized with drugs and chemicals)

This booklet discusses burial as an option for on-farm disposal of livestock or poultry mortalities.

GROUNDWATER CONTAMINATION CONCERNS

Burial of mortalities in areas susceptible to groundwater contamination could result in adverse effects in nearby wells. The potential for groundwater contamination and subsequent well water contamination depends on the soil group, soil texture and groundwater depth.

Soil Group

Soils with varying amounts of organic matter and soil structure have different levels of risk for groundwater contamination.

Soil Texture

Coarse soils may increase groundwater contamination risks as they allow liquids to rapidly move away from the burial site with minimal filtration or treatment.

Groundwater Depth

The zone above the groundwater table up to the soil surface is effective in destroying some biological contaminants. However, this zone is quite small in areas where the water table is high.

Note: Shallow bedrock depth may also be a concern in a few areas of the province. Open fractures in bedrock permit rapid movement of contaminated water with minimal filtration or treatment.

Depending on the combination of these three main features, the groundwater contamination potential could change. Alberta's Environmental Farm Plan (EFP) defines a method for determining the potential for groundwater contamination on the farmstead. It suggests how to determine if the groundwater contamination potential is:

- 1 - High
- 2 - Moderate
- 3 - Low

There are no ideal burial conditions to reduce the potential for groundwater contamination. Areas with clay soils may have a high groundwater level and areas of thin soil cover over a bedrock layer should be avoided. For the purposes of this booklet, **Table 1** can be used to determine which groundwater contamination category a burial site falls into. It should be noted that the Alberta Regulation for burial in the *Destruction and Disposal of Dead Animals* specifies that the bottom of the pit must be at least 1 m (3 ft) above the seasonal high water table.

Table 1. Simplified method of determining groundwater contamination potential.

Soil Group (Rating i)	Sub Surface Soil Texture (Rating vii)	Depth to Aquifer (Rating viii)
Brown (3)	Coarse Textured Soils (1)	< 8 m (30 ft) (1)
Dark Brown (2)	Medium Textured Soils (2)	8 - 30 m (30 - 100 ft) (2)
Black (1)	Fine Textured Soils (3)	> 30 m (100 ft) (3)
Gray (1)		

Contamination potential = $\frac{\text{i + vii + viii}}{3}$

(if result is a fraction, round up to next whole number).

1 (High); 2 (Moderate); 3 (Low)

SURFACE WATER CONTAMINATION CONCERNS

Improper burial of mortalities can also result in surface water contamination. This can affect the water quality draining into watercourses, open-top catch basins and ponds. Some land has a higher potential for surface water contamination due to topography and soil type.

Topography

Hilly land is more of a concern than flat land since it promotes more rapid surface water runoff during the spring or a heavy rainfall.

Soil Type

Since they promote more rapid runoff, heavier soils such as clay are a higher concern than lighter soils such as sand.

The best soil condition to reduce groundwater contamination is a fine-grained, heavy soil like clay. Unfortunately, it also helps promote rapid runoff that can contribute to surface water contamination. This paradox complicates the choice for an ideal burial site. For purposes of this booklet, it is assumed that the burial site is relatively flat (less than 2% slope) and that the site is evaluated for its groundwater contamination potential (**Table 1**).

HOW SUITABLE IS YOUR LAND FOR MORTALITY BURIAL?

To check the suitability of a site for burying mortalities consult soil and topographic maps, and dig test holes in the area to see how close the groundwater is to the soil surface. Test holes should be dug in early spring when the groundwater is normally at its highest. Soil auger probes (50 mm dia.) are available in extendable lengths for simple depth investigations of up to 3 m (10 ft).

Again, mortalities should not be buried on hilly land as the soil covering the mortalities could wash out during rainstorms leading to surface water contamination. Keep burial sites on relatively flat land with a slope of less than 2% (2 metre drop for every 100 metres).

Other Concerns

If mortalities are not buried properly, wild animals, dogs, or birds could exhume them and contribute to the spread of disease. Partially decayed mortalities are unsightly, attract rodents, smell, and provide a breeding ground for flies.

EXPECTED MORTALITY LOSSES

Different types of animals have different death losses, but death rates are usually highest when the animals are young. Estimated livestock and poultry mortalities are listed in **Appendix A.**

BURIAL GUIDELINES

Burying mortalities during cold weather when the ground is frozen is very difficult, both from the aspect of excavating frozen ground and from trying to cover the mortalities with frozen dirt (see "Buried Depth and Cover" for alternative). During the winter some species such as beef, swine, dairy, bison, horses and poultry can be picked up by rendering companies. Other species such as sheep, goats, alpaca, elk and deer must be kept frozen in a secured area until they can be buried in the spring.

Use common sense when burying mortalities. Some guidelines were originally developed by the Missouri Department of Natural Resources, but have been adapted for Alberta conditions and are based on a safe maximum mortality weight per area of land.

Burial Rates and Spacing of Burial Sites

The suggested burial rate varies according to the EFP method for determining the potential for groundwater contamination (see **Tables 1** and **2**). The burial of mortalities is not recommended in soils with a high groundwater contamination potential.

Table 2. Recommended burial rates of animal and poultry mortalities based on groundwater contamination potential.

Groundwater Contamination Potential	Maximum kg of Mortalities Buried per Hectare per Year	Pit Spacing*
1 (High)	0 kg	N/A
2 (Moderate)	2500 kg	100 m
3 (Low)	5000 kg	70 m

*Based on maximum of 2500 kg per burial site

Several small burial sites that are spread out with fewer mortalities in each hole are better than fewer, larger sites with many mortalities in each. Therefore, it is recommended that each burial site contain no more than 2500 kg (5500 lbs) of mortalities. They should not be less than 70 m (230 ft) apart for a low contamination potential site, and 100 m (328 ft) for a moderate site.

Returning to the Same Burial Site

Farmers should not use more than approximately 10% of their land for burial in any one year. Therefore, only use a burial site once every 10 years.

Burial Depth and Cover

The burial hole should be 1.0 - 1.2 m deep (3 - 4 ft) below the original ground level. Deeper holes are more difficult to dig, particularly if the inside slopes are quite steep. Shallower holes will not allow for at least 0.6 m (2 ft) of compacted soil cover, and wider and longer holes could take a long time to fill before moving to another site.

Unfortunately, there are two problems associated with filling a hole over an extended period. Firstly, the mortalities may only be partially covered with soil between burial intervals allowing exhumation by wild animals or dogs. Secondly, an open hole can be hazardous to wildlife, domestic animals, farm equipment, hunters, all terrain vehicles, and children.

There are two methods of covering mortalities. They can be immediately covered with a minimum of 0.6 m (2 ft) of compacted soil, which also includes 0.3 m (1 ft) of soil crowned up over the hole. This mounding helps prevent scavenging animals from digging up the mortalities, allows the soil to settle, and helps shed surface water.

An alternative method for covering mortalities uses 0.15 m (6 in) of soil between burial intervals with the addition of 0.5 kg (1 lb) of quick lime for every 10 kg of mortalities for controlling odour and flies.

The hole is then capped with a 13 mm (0.5 in) thick, 1.2 x 2.4 m (4 x 8 ft) piece of plywood (or equivalent), secured on the top edges with soil. The lid is removed and replaced every time mortalities are added. It is a good idea to install a bright flag warning of the hole location. Try not to leave a hole such as this "unfilled" for any more than a few days.

Distances From Burial Sites to Wells

To protect the water in wells, the separation distances in **Table 3** are recommended. They are based on the EFP method for determining the groundwater contamination potential.

Table 3. Recommended separation distances between burial sites and wells.

Groundwater Contamination Potential	Drilled, or Dug Wells
1 (High)	N/A
2 (Moderate)	150 m
3 (Low)	100 m

If burial sites are located on relatively flat land (less than 2% slope) the separation distances from burial sites to open-top catch basins, ponds used for watering livestock or poultry, or natural watercourses should not be less than 100 m (328 ft).

Other Separation Distances

Neighbours may be concerned about the burial of dead animals on the farm because of odours, aesthetics, flies, dogs, vermin, or contamination of their drinking water. As a guideline, do not bury mortalities less than 100 m (328 ft) from any livestock facility, including pastures situated on land owned or leased by another person, and 100 m (328 ft) from neighbouring homes. Burial sites must be at least 300 m (984 ft) from a primary highway, 100 m (328 ft) from a secondary highway, and 50 m (164 ft) from any other road allowance. If possible, keep mortalities and burial sites out of view.

DIGGING A PROPER HOLE

Two methods for digging a hole are using a backhoe (for large holes) or a tractor-mounted posthole auger (for smaller holes). Holes may also be dug using a shovel, but this is time consuming and difficult to do on a regular basis.

Using a Backhoe

A contractor can be hired to dig a deep, narrow hole (generally one or two hoe-widths wide). To keep mortality weight in the hole less than 2500 kg (5500 lbs), big holes should not be more than 1.2 m (4 ft) deep, 4.3 m (14 ft) long, and 1 m (3 ft) wide. The excavated volume of a hole this size is about 5.2 m^3 (6.8 yd^3) and can be dug in less than half an hour by an experienced backhoe operator. The size of the pit required may vary with species type, but generally 0.22 m^3 per 100 kg (3.5 ft^3/100 lbs) of mortality is adequate.

Problems associated with larger holes include rainwater accumulation in the hole between burials, and safety concerns with slumping inside slopes since they are usually steep. No one should ever jump into a deep hole such as this since unstable side slopes could collapse.

Using a Tractor-Mounted Posthole Auger

Tractor-mounted posthole augers are available in several diameters. The smallest hole diameter to consider for mortality purposes is 0.3 m (1 ft). Anything smaller will not fit a 25 kg (55 lb) mortality without some difficulty. For farmers with many mortalities to bury, owning a tractor-mounted auger with bore diameters up to 0.6 m (2 ft) might be justified. Again, cover mortalities between burial

intervals with at least 0.15 m (6 in) of soil, use a secured plywood cap, and flag the hole to provide warning. Do not leave a hole unfilled for any more than a few days. A hole 1.2 m (4 ft) deep and 0.3 m (1 ft) in diameter can hold up to 50 kg (110 lbs) of mortalities. A few holes could be dug at once, then used as required, provided they are suitably covered, secured, and marked with warning flags.

RECORD KEEPING

A record should be kept of the burial sites to avoid digging again too soon in the same location. Important information to record for each site is it's:

- Exact location in relation to some fixed point.
- Date of burial.
- Type and size of animal mortalities.
- Reason for death.
- Approximate total weight of mortalities.

An aerial photo of the farm might be helpful in record keeping since the burial location could be drawn on it.

This booklet was revised from Ontario's Ministry of Agriculture, Food and Rural Affairs fact sheet *Proper Burial Techniques for Small Animals and Poultry Mortalities Under 25 kg.*

Appendix A DEATH LOSS VALUES

Species	Type	Average Death Loss (%)	Average Weight Per Bird or Animal (kg)	Cycle Length (days)	Expected Daily Mortality Weight (kg) [1]
Beef Cattle	Cows and Bulls	1.0	650	365	0.0178
(a) Cow-calf	Calves (newborn)	3.0	40	60	0.0200
	Calves (pre-weaning)	2.0	150	200	0.0150
	Replacements	1.0	350	240	0.0146
(b) Feedlot	Backgrounders	2.0	300	180	0.0333
	Feeders	1.0	425	120	0.0354
Bison	Cows and Bulls	2.0	550	365	0.0301
	Calves	2.0	75	240	0.0063
	Replacements	2.0	300	365	0.0164
	Feeders	2.0	350	365	0.0192
Dairy/Cattle	Cows	4.0	650	365	0.0712
	Calves (0 - 7 months)	10.0	125	210	0.0595
	Calves (7 - 14 months)	2.0	275	210	0.0262
	Replacements (14 - 27 months)	1.0	450	365	0.0123
Elk	Cows	3.2	275	365	0.0241
	Bulls	1.8	350	365	0.0173
	Calves (100 days)	1.8	100	100	0.0180
	Replacements	2.0	230	365	0.0126
Goats	Does and Bucks	3.0	67	365	0.0055
	Kids (pre-weaning)	7.5	7.5	60	0.0094
	Kids (feeder)	5.0	25	180	0.0069
Horses	Mares/Stallions (light/draft)	1.5	500/850	365	0.0205/0.0349
	Foals (light/draft)	6.0	110/150	365	0.0181/0.0247
	Yearlings (light/draft)	2.5	350/650	365	0.024/0.0445
Poultry	Hens (layers)	8.0	1.8	365	0.0004
	Hens/Cockerels (breeders)	14.5	3.8	294	0.0019
	Chicken Broilers	5.0	0.8	40	0.0010
	Turkey Broilers	5.5	2.3	77	0.0016
	Turkey Hens, Geese, Ducks	7.5	7.5	92	0.0061
	Turkey Toms	12.5	12.2	114	0.0134
Sheep	Ewes and Rams	3.0	70	365	0.0058
	Lambs (pre-weaning)	12.5	12	60	0.0250
	Lambs (feeders)	5.0	35	80	0.0219
Swine	Mature Sows/Boars	5.5	200	365	0.0301
	Pre-weaning	19.0	2	21	0.0181
	Weaners	2.6	13	42	0.0080
	Growers	1.7	45	56	0.0137
	Finishers	2.5	88	56	0.0393

[1] Daily mortality is calculated based on typical production cycle length and on a per animal or bird basis. For example, during calving season, newborn calf losses for a 60-day period is about 0.02 kg per day. For 100 calvings (including aborted and stillborn) the expected daily mortality would be 2 kg.

References

Proper Burial Techniques for Small Animals and Poultry Mortalities Under 25 kg
Ontario Ministry of Agriculture, Food and Rural Affairs, November, 1996.